Service Manual for Volumetric Infusion Pump green stream® ARGUS 707

Made in Switzerland

$C\epsilon$ 0120

ARGUS Medical AG, CH-3627 Heimberg / Switzerland
(A member of the CODAN group)

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1. INTRODUCTION

1.1. General

IMPORTANT!
This service manual is intended for the exclusive use of authorized persons who have been trained by ARGUS Medical AG in the maintenance and repair of the ARGUS 707 infusion pump.
The service manual is meant to be used together with the user manual.

IMPORTANT!
ARGUS Medical AG shall not assume any responsibility for any manipulations which have been carried out on the ARGUS 707 infusion pump by a non-authorized person.

This manual contains the latest data available. It is subject to further modifications in accordance with technical improvements.

2. PUMP CONFIGURATIONS

2.1. General

CAUTION!
The configuration possibilities constitute a modification of the pump and may only be carried out by authorized persons!

CAUTION!
After changing the configuration a function check and a control measurement has to be performed!

2.2. Interrogation mode

With the interrogation mode you can read the present configuration of the pump without the possibility to modify any configurations.

1. To enter into the interrogation mode, switch the pump on while keeping the keys "MODE" and START/STOP" pressed.

2. Press the "START/ STOP" key.

4. To quit the interrogation mode press the "ON/OFF" key at least 2 seconds.

3. Enter the requested address (see chapter 2.6), e.g. 52.
The programmed value of the address 52 appears in the right hand display.
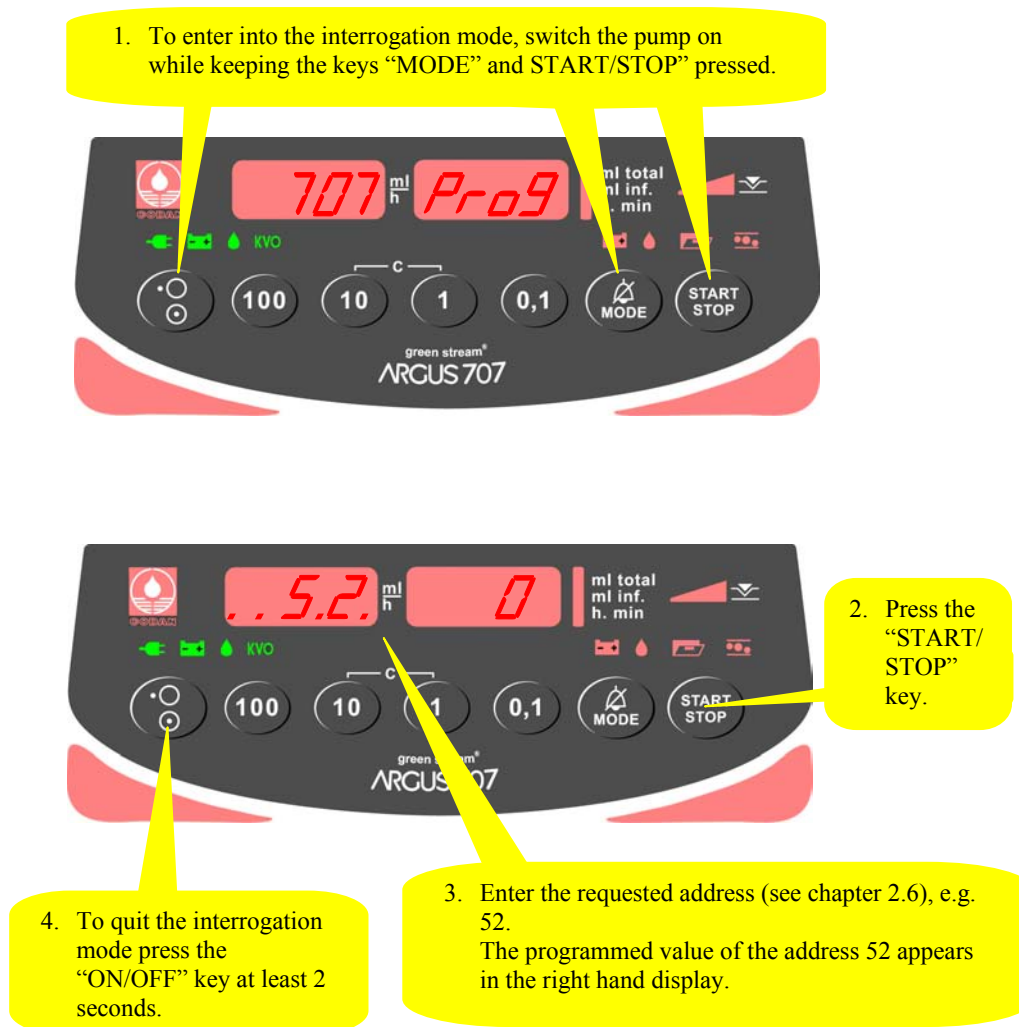
Flashing decimal points indicate which display is ready to accept an input by the keys 100, 10 & 1.

In the interrogation mode the left hand display shows the address and the right hand display shows the according value configured at this address. Please refer to chapter 2.6 where the meanings of the addresses are explained.

To modify any configuration data you have to go into the configuration mode.

2.3. Configuration mode

The configuration mode alows you to modify the pump configuration manually. Please refer to chapter 2.6 where the meaning of the configuration adresses are explained.

2.3.1. Step 1

1. To enter into the configuration mode, switch the pump on while keeping the keys "MODE" and START/STOP" pressed.

2. Press key "START".

3. Press key "MODE".

4. Press key "START" again. The display will show "Cod ----".

2.3.2. Step 2

5. Enter the PIN Code. If no PIN code was configured before, default PIN 0 will be active. For PIN 0 press the key "10" while keeping the key "1" pressed.

6. Press key "START" to acknowledge the entered PIN code.

    If the PIN was not accepted, the display will change back to step 2.

If the PIN code was accepted the pump will show the display of chapter 2.3.1 again, but you have now access to all writeable addresses in the list of chapter 2.6.

Select therefore any address in the left display (see next side):

2.3.3. Step 3

7. After entering an address e.g. 10 press the key "MODE". The flashing decimal points will change to the right hand display.

8. Enter now the value on the right hand display. The range of the value is given by the table in chapter 2.6.

9. Press key "START" to acknowledge the value entered.
The flashing decimal points change back to the left hand display.

10. To quit the configuration mode press the "ON/OFF" key at least 2 seconds.
Changes in configuration become active, if the pump is switched on normally again.

Important remark:
Invalid values entered will be corrected automatically by the pump to the maxima or minima value allowed for the according address!

2.4. First activation of a configuration PIN Code

The activation of a PIN code allows you to protect the configuration from unauthorized persons.
To activate the PIN code, **enter the configuration mode** as described in the previous chapter. For this use the default PIN code "0":

1. To enter into the configuration mode, switch the pump on while keeping the keys "MODE" and START/STOP" pressed.

2. Press key "START".

3. Press key "MODE".

4. Press key "START" again. The display will show "Cod ----".

5. Enter the default PIN Code "0". To do this press the key "10" while keeping the key "1" pressed. Press "START" key to acknowledge the entered PIN code.

6. Press the "MODE" key. The flashing decimal points will change to the right hand display

8. Press key "START" to acknowledge to new PIN.

7. Enter now the new PIN Code (max. 4 digit number). Please remember this code, it will never be visible again!

After you switch the pump OFF and ON again you can enter the configuration mode only, if you enter the correct PIN code in display of chapter 2.3.2.

Please note: The interrogation mode can always be accessed without the PIN.

2.5. Changing an existing pin code

Enter the configuration mode (see chapter 2.3), select address 0 and enter the new pin code.

2.6. Address list of the pump configuration

Add.:   Address   Def.:   Default value of the manufacturer
P: Protection grade (W = Write enabled)

Add.	Def.	P	Function	Range
0	0	W	PIN code active	0=No; 1=Yes
1	1	W	Run indication by running decimal point	0=No; 1=Yes
2	0	W	Key [ON/OFF] only at STOP valid	0=No; 1=Yes
3	0	W	Rate change only at STOP valid	0=No; 1=Yes
4	0	W	Key [STOP] delayed (time at #361)	0=No; 1=Yes
5				
6	0	W	Static alarm (staff alerting system)	0=No; 1=Yes
7	0	W	Display elapsed time in run mode (#8=0)	0=No; 1=Yes
8	0	W	Select remaining time (#7=1)	0=No; 1=Yes
9				
10	0	W	Operation without drop detector	0=No; 1=Yes
11	1	W	Recall "ml/h" (rate) at next power on	0=No; 1=Yes
12	0	W	Recall "ml total" (end volume) at next power on	0=No; 1=Yes
13	0	W	Recall "ml inf." (volume inf.) at next power on	0=No; 1=Yes
14	0	W	SBS Step by step function	0=No; 1=Yes
15	0	W	Display VTBI (Volume To Be Infused)	0=No; 1=Yes
16				
17	1	W	KVO (KOR, mode see (#60)	0=No; 1=Yes
18	0	W	Drop alarm only if bottle empty (#10=0, => 'trA' as default)	0=No; 1=Yes
19	1	W	Buzzer at start	0=No; 1=Yes
20	0	W	Menu 'CLr' (Clear "ml inf.") (#15=0)	0=No; 1=Yes
21				
22	0	W	Menu 'trA' (Transport)(#10=0)	0=No; 1=Yes
23	1	W	Menu 'PrL' (Pressure alarm limit)	0=No; 1=Yes
24	1	W	Menu 'CAP' (Battery Capacity)	0=No; 1=Yes
25	0	W	Menu 'SEt Fill'	0=No; 1=Yes
26				
27	0	W	Menu 'dLo' (Data-lock)	0=No; 1=Yes
28	0	W	Menu 'Stb' (Stand-by)	0=No; 1=Yes
29	0	W	Menu 'MEd' (Medication-no.)	0=No; 1=Yes
30	0	W	Menu 'tM ' (Timer alarm)	0=No; 1=Yes
32	0	W	Menu 'boL ' (Release Bolus)	0=No; 1=Yes
33	0	W	Menu 'boLr' (Bolus rate)(#32=1)	0=No; 1=Yes
34	0	W	Menu 'tot ' (Bolus total)(#32=1)	0=No; 1=Yes
38	0	W	BOLUS application automatic (#32=1,#34=1)	0=No; 1=Yes
40	0	W	Demo mode (menus addr. 20..34 and 7 enabled)	0=No; 1=Yes
41	0	W	Clear "ml/h" after infusion completed	0=No; 1=Yes
42	0	W	Clear "ml total" after inf. completed (#41=1)	0=No; 1=Yes
43	0	W	Air volume accumulated, see #350 and 351	0=No; 1=Yes
44	1	W	Automatic pressure release after occlusion	0=No; 1=Yes
45	1	W	Pressure display (bar graph)	0=No; 1=Yes
46	0	W	Pressure display with indicator (#45=1)	0=No; 1=Yes
47	0	W	Standby- and battery pre alarm low volume	0=No; 1=Yes
48	0	W	Flashing numeric display at alarm	0=No; 1=Yes
49	0	W	Alarm acknowledge only with key [MODE]	0=No; 1=Yes

	Add.	Def.	P	Function	Range
	50	0	W	Start with >= 1bar downstream pressure allowed	0=No; 1=Yes
	55	0	W	Set default serial interface to RJ-45 connector	0=No; 1=Yes
	60	0	W	KVO only after infusion completed	0=No; 1=Yes
	101	1		Set 1 enabled (always enabled)	0=No; 1=Yes
IV-Set 1 definitions	201	1091	W		
	202	1071	W		
	203	1061	W		
	204	1051	W		
	205	1031	W		
	206	1023	W		
	207	1014	W		
	208	1006	W		
	209	999	W		
	210	988	W		
	211	974	W		
	212	967	W		
	213	947	W		
	214	939	W		
	215	917	P		
	216	900	W		
	217	1000	W		
IV-Set 1 parameters	306	0		Infused sum in ml (xxxxyyyy)	[xxxx.... ml]
	307	0		Infused sum in ml (xxxxyyyy)	[....yyyy ml]
	308	0		Operating time in min (xxxxyyyy)	[xxxx.... min]
	309	0		Operating time in min (xxxxyyyy)	[....yyyy min]
	310	9999	W	Max. rate in **(1/10)ml/h**	(1...9999)
	311	999	W	Prime rate in ml/h	(1...999)
	312	1200	W	Max. bolus rate in ml/h	(1...1200)
	313	10	W	Max. bolus total in ml	(1...999)
	314	10	W	Upstream occlusion sensitivity (0...60, 60 is highest sensitivity)	(0...60)
	316	7	W	Downstream pressure limit "PrL" default value	(1...10)
	317	250	W	Air bubble size [microliters]	(50...1000)
	318	20	W	Drop-rate window center in [drops/ml]	(10...65)
	319	1000	W	Correction factor ((actual/nominal)*1000) refer to chapter 5.5	(850...1150)
	350	20	W	Air summation volume, n * 50 [microliters]	(2...40)
	351	4	W	Air summation time, n * 8 [min]	(8..64)
	361	500	W	Key [ON/OFF] delay (additional key [STOP] if #4=1)	(0...3000)
	362	8	W	Display brightness	(2...15)
	363	10	W	Buzzer alarm volume	(5...10)
	368	300	W	Battery discharge time incl. 15min pre-alarm in [min]	(45...300)
	369	5	W	Automatic Menu fall back delay time in [s]	(5...30)

Add.	Def.	P	Function	Range
370	0	W	Clock seconds	(0...59)
371	0	W	Clock minutes	(0...59)
372	0	W	Clock hours	(0...23)
374	0	W	Clock days	(1...31)
375	0	W	Clock months	(1...12)
376	0	W	Clock years	(2000...2099)
380	0		Last failure number (F-XX)	Refer to chapter 5.7
381	0		Last infusion rate at failure	
382	0		.	
383	0		.	
384	0		.	
385	0		.	
386	0		.	
387	0		.	
388	0		Oldest failure number (F-XX)	
389	0		Oldest infusion rate at failure	
390	0	W	Last service date	(yyww, year and week)
391	0		2. last service date	(yyww, year and week)
392	0		3. last service date	(yyww, year and week)
393	0	W	Service interval in months (0 = disabled)	(0...24)
394	0	W	Service interval in hours of operation (0 = disabled)	(0...9999)
395	0	W	Own address for SCI (0 = no address)	(0...127)
396	xxx	W	Serial number of the pump (xxxx yyyy)	[xxxx....]
397	8yyy	W	Serial number of the pump (xxxx yyyy)	[....yyyy]
399	707		Data xxxx -> clears protection key	

2.7. Special configuration options

1. Configuration of a reminder alarm for the safety standard check:

   If a safety standard check reminder alarm is configured, the pump will display "CtrL" after power up when the time has come to perform a standard safety check. To configure a reminder alarm please follow next steps:

   First the service interval has to be entered either in months or in hours of operation, or both (address 393, 394).
   Next the last service date has to be entered on address 390. Any value higher than 0 entered at the address 393 and/or 394 will release the reminder alarm after the service interval has elapsed (check also the correct settings of the internal clock).

2. PC configuration tool "AConfig":

   With this additional software the pump may be configured from a PC over the serial port. This software may be available from your local distributor or ARGUS Medical AG.
   Caution: AConfig may only be used with software versions greater or equal to 1.01.

3. CONFIGURATION AND HISTORY PRINTOUT

3.1. Introduction

CAUTION!
The infusion pump has to be disconnected from the patient before and while the serial interface cable is connected to the pump.

The connection of the ARGUS 707 over the serial interface RS 232 can be done by connecting the interface cable no.10.093 to the serial interface outlet of the serial COM port of a PC.
A data transfer between ARGUS 707 and a PC can be done without any additional software running on the PC.

3.2. Settings of the terminal program

3.2.1. RS232 connection settings of the terminal program

Open the terminal program on the PC, e.g. HyperTerminal, which has been included in every Microsoft® Windows® Operating System.

In the "Connection Description" menu, type for e.g. "ARGUS" and click OK.

Please make sure that the correct COM port of the PC has been selected.

Make the appropriate changes on the "COM Properties" menu according to the right hand picture:

Click OK, then a connection to the pump should now be established.
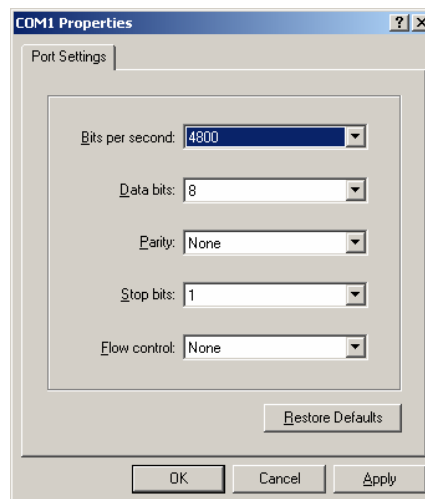
3.2.2. Capturing text from the pump transmitted

If you intent to print out the configuration or the history events transmitted from the pump, you should capture the text transmitted by the pump into a text file. To do this please select "Capture Text" in the hyper terminal's menu.

A "File box" will open; type a descriptive name for the file, and then click "Start". The terminal program starts to capture each text received over the serial interface.
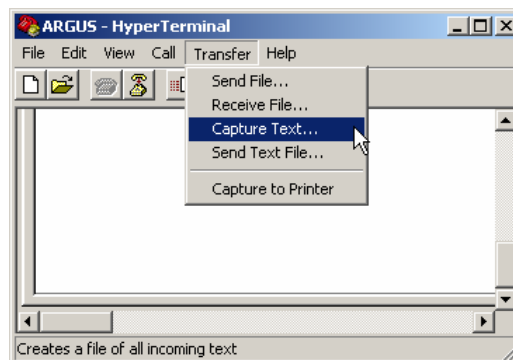
Stop the capturing **after** you did the required pump settings.
To do this select "Stop" in the menu "Capture Text" of the terminal program. You will then have a text file including the data transmitted by the pump.
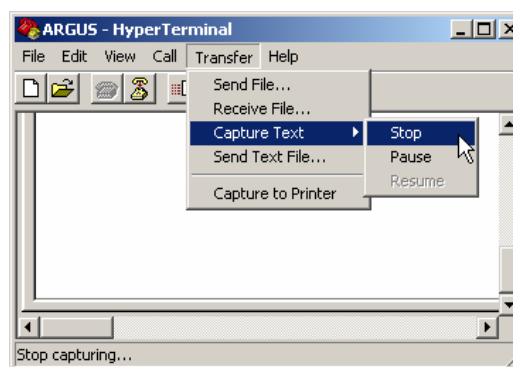
3.3. Configuration printout

Connect the ARGUS 707 to your PC (see chap. 3.1) and setup the terminal program (see chap. 3.2). Start to capture text on the PC side before you switch the pump on.

1. Enter into the configuration mode (see chapter 2.3).

2. Select address 399 in the left hand display.

3. Enter value 3456 in the right hand display.

4. Press the "START/STOP" key. The pump will now transfer the actual pump configuration as text.
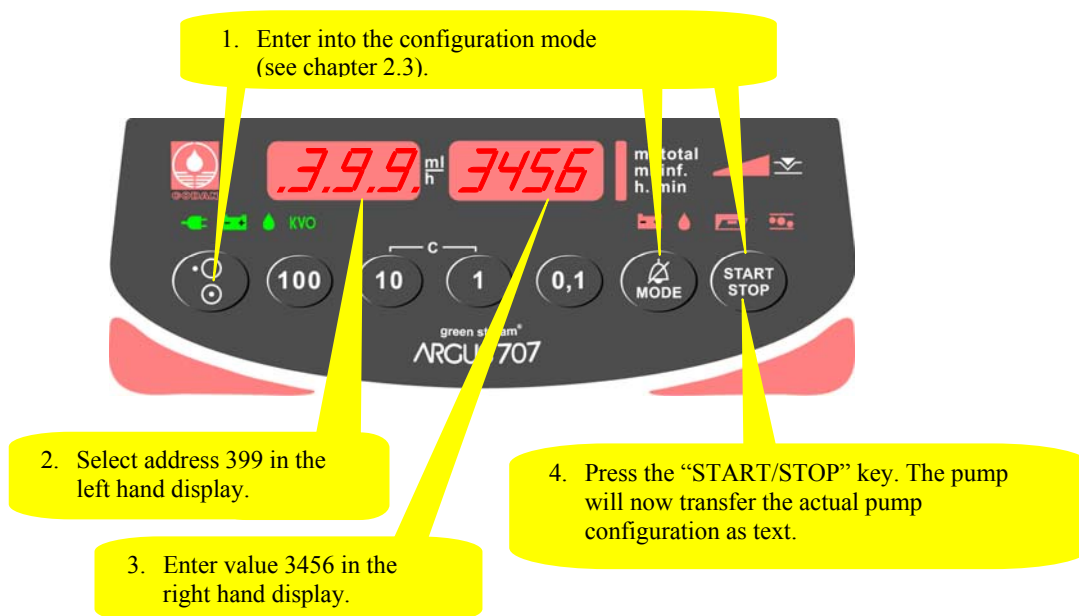
By saving the transmitted configuration text, you may print it using any text program.
See the following example of a configuration printout:

3.3.1. Configuration printout example

```
/***** Configuration *****/                    Sat 17-Jan-2004 19:00:09

Pump type        : ARGUS707
Inventory number : 005 8 407
Software release : V1.00  (031218-75C2)
Infused sum      : 861ml
Operating time   : 15h18min
Last service date :

00=0    50=0    100=0   150=0   200=0000    250=0000    300=0000    350=0020
01=1    51=0    101=1   151=0   201=1091    251=0000    301=0000    351=0004
02=0    52=0    102=0   152=0   202=1071    252=0000    302=0000    352=0000
03=0    53=0    103=0   153=0   203=1061    253=0000    303=0000    353=0000
04=0    54=0    104=0   154=0   204=1051    254=0000    304=0000    354=0000
05=0    55=0    105=0   155=0   205=1031    255=0000    305=0000    355=0000
06=0    56=0    106=0   156=0   206=1023    256=0000    306=0000    356=0000
07=0    57=0    107=0   157=0   207=1014    257=0000    307=8611    357=0000
08=0    58=0    108=0   158=0   208=1006    258=0000    308=0001    358=0000
09=0    59=0    109=0   159=0   209=0999    259=0000    309=2918    359=0000
10=0    60=0    110=0   160=0   210=0988    260=0000    310=9999    360=0000
11=1    61=0    111=0   161=0   211=0974    261=0000    311=0999    361=0500
12=0    62=0    112=0   162=0   212=0967    262=0000    312=1200    362=0008
13=0    63=0    113=0   163=0   213=0947    263=0000    313=0010    363=0010
14=0    64=0    114=0   164=0   214=0939    264=0000    314=0010    364=0000
15=0    65=0    115=0   165=0   215=0917    265=0000    315=0000    365=0000
16=0    66=0    116=0   166=0   216=0900    266=0000    316=0007    366=0000
17=1    67=0    117=0   167=0   217=1000    267=0000    317=0250    367=0000
18=0    68=0    118=0   168=0   218=0000    268=0000    318=0020    368=0300
19=1    69=0    119=0   169=0   219=0000    269=0000    319=1000    369=0005

20=0    70=0    120=0   170=0   220=0000    270=0000    320=0000    370=0012
21=0    71=0    121=0   171=0   221=0000    271=0000    321=0000    371=0000
22=0    72=0    122=0   172=0   222=0000    272=0000    322=0000    372=0019
23=1    73=0    123=0   173=0   223=0000    273=0000    323=0000    373=0000
24=1    74=0    124=0   174=0   224=0000    274=0000    324=0000    374=0026
25=0    75=0    125=0   175=0   225=0000    275=0000    325=0000    375=0007
26=0    76=0    126=0   176=0   226=0000    276=0000    326=0000    376=2003
27=0    77=0    127=0   177=0   227=0000    277=0000    327=0000    377=0000
28=0    78=0    128=0   178=0   228=0000    278=0000    328=0000    378=0000
29=0    79=0    129=0   179=0   229=0000    279=0000    329=0000    379=0000

30=0    80=0    130=0   180=0   230=0000    280=0000    330=0000    380=0000
31=0    81=0    131=0   181=0   231=0000    281=0000    331=0000    381=0000
32=0    82=0    132=0   182=0   232=0000    282=0000    332=0000    382=0000
33=0    83=0    133=0   183=0   233=0000    283=0000    333=0000    383=0000
34=0    84=0    134=0   184=0   234=0000    284=0000    334=0000    384=0000
35=0    85=0    135=0   185=0   235=0000    285=0000    335=0000    385=0000
36=0    86=0    136=0   186=0   236=0000    286=0000    336=0000    386=0000
37=0    87=0    137=0   187=0   237=0000    287=0000    337=0000    387=0000
38=0    88=0    138=0   188=0   238=0000    288=0000    338=0000    388=0000
39=0    89=0    139=0   189=0   239=0000    289=0000    339=0000    389=0000

40=0    90=0    140=0   190=0   240=0000    290=0000    340=0000    390=0000
41=0    91=0    141=0   191=0   241=0000    291=0000    341=0000    391=0000
42=0    92=0    142=0   192=0   242=0000    292=0000    342=0000    392=0000
43=0    93=0    143=0   193=0   243=0000    293=0000    343=0000    393=0000
44=1    94=0    144=0   194=0   244=0000    294=0000    344=0000    394=0000
45=1    95=0    145=0   195=0   245=0000    295=0000    345=0000    395=0000
46=0    96=0    146=0   196=0   246=0000    296=0000    346=0000    396=0000
47=0    97=0    147=0   197=0   247=0000    297=0000    347=0000    397=0000
48=0    98=0    148=0   198=0   248=0000    298=0000    348=0000    398=0000
49=0    99=0    149=0   199=0   249=0000    299=0000    349=0000    399=0707
```

3.4. History printout

3.4.1. General

Connect the ARGUS 707 to your PC (see chap. 3.1) and setup the terminal program (see chap. 3.2). Start to capture text on the PC side before you switch the pump on.

1. Switch the pump on while keeping the key "100" pressed
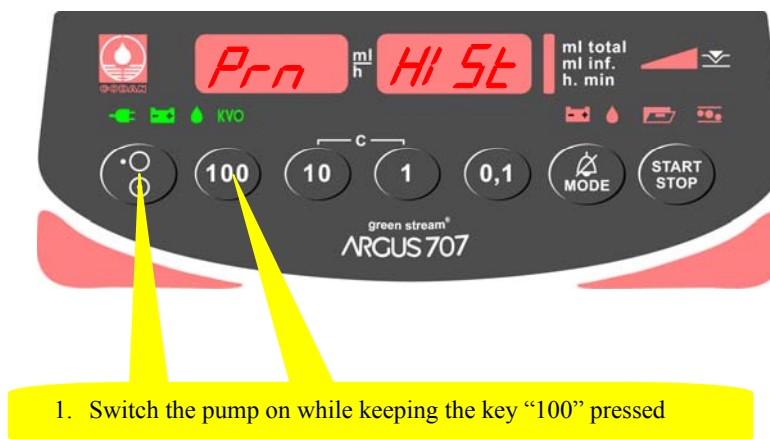
3.4.2. History header

At the top of the history, a header will appear showing the device type, the software release and if configured, the inventory number and the last service date.
It shows also the pump internal real time at the moment of the printout.

Please note that there may be one hour summer or winter time deviation!

3.4.3. History events

Each registered event starts with a message line. Please refer to the complete list mentioned in chapter 3.4.5 which shows the possible messages generated by the user's handling on the pump or by the pump itself.
Each event has a time stamp on the right side of the second line.

3.4.4. History printout example

```
/***** History *****/                       Tue 20-Jan-2004 19:40:30


Pump type         : ARGUS707
Inventory number  : 005 8 407
Software release  : V1.00  (031218-75C2)
Infused sum       : 388ml
Operating time    : 24h44min
Last service date :

Pump off
Rate   = 0040.0ml/h     Inf-Set = 1         Tue 20-Jan-2004 18:29:22
Total  = 0000.0ml       PrLimit = 0700mbar
Infsum = 0000.0ml       Status  = 0x0000

Pump on
Rate   = 0040.0ml/h     Inf-Set = 1         Tue 20-Jan-2003 18:27:18
Total  = 0000.0ml       PrLimit = 0700mbar
Infsum = 0000.0ml       Status  = 0x0000
```

3.4.5. History messages

Possible messages appearing in the first line of each history event:

```
No information available        Not enough drops, pump stop
Battery defective               Too many drops, pump stop
Battery low pre alarm           Door open, pump stop
Battery low, pump stop          Inf-Set change
Bolus start                     Timer alarm, pump stop (KVO)
Bolus stop                      Total volume reached, pump stop (KVO)
External power off              Data lock off
External power on               Data lock on
Downstream occlusion, pump stop Infsum cleared
PrLimit change                  Transport off
Pump has detected failure       Transport on
Pump off                        Air bubble, pump stop
Pump on                         Bolus total reached
Pump start                      Exit setup mode
Pump stop (KVO)                 PC configuration done
Rate change                     PC configuration failure
Enter setup mode                Pump start, ext. changed parameters
No drops, pump stop             Upstream occlusion, pump stop
```

4. SOFTWARE UPDATES

4.1. General

This chapter describes the procedure to perform a software update on the ARGUS 707 infusion pump. To check the installed software release in your ARGUS 707 press the "MODE" key while switching on the pump.

Please refer to your local distributor or ARGUS Medical AG to determine the latest software release able to run on your device hardware.

4.2. Requirements for a software update

To update an ARGUS Medical device, the following items are needed:

- A PC with Microsoft® Windows™.
- RS 232 serial interface cable (part no. 10.093), connected to the PC.
- Software file "AMFlasher" and corresponding user instruction (pdf-file) on your PC.
- Data file "A707_xxx.txt" including the pump software which can be downloaded with the "AMFlasher" software.
  The file name "A707_xxx.txt" contains the software release (xxx) version of the pump software release.

Those items are available from your local distributor or from ARGUS Medical.

4.3. Safety aspects

Be aware of the following points:

- **For medical device traceability your local distributor or ARGUS Medical AG needs to be informed about every device updates (serial number) you performed!**

- **Do not make any software updates when the device is used and/or connected to a patient!**

CAUTION!
A standard safety check (see appendix) has to be performed after every software update!

5. MAINTENANCE

5.1. General

CAUTION!

Only authorized persons who have been trained by ARGUS Medical AG or by the local distributor are allowed to service the ARGUS 707 infusion pump. In case of repair request, send the unit to the local distributor with a report outlining the exact nature of the failure. More information is available from:

ARGUS Medical AG
CH-3627 Heimberg / Switzerland
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CAUTION!

The safety standard check has to be performed at least every 24 month or after 10'000 hours of operation. The check has to be done in accordance to the chapter 7. No special maintenance of the ARGUS 707 infusion pump is necessary. There are no wear and tear parts.

5.2. Recalibration

5.2.1. General

Unless otherwise specified by the customer, the ARGUS 707 has been calibrated by the manufacturer with the CODAN L86 infusion set. If a different infusion set is used (see recommended list in the appendix of the user manual), a recalibration is required.

CAUTION!

A recalibration with a different IV-set always requires a recalibration of both pressure sensors and a volumetric calibration!

CAUTION!

It is mandatory to execute first the calibration procedure of the pressure sensors and afterwards the volume calibration.

5.3. Pressure calibration

5.3.1. General

The volumetric infusion pump ARGUS 707 contains two pressure sensors:
- One upstream sensor, bottle side (left input)
- One downstream sensor, patient side (right output).

CAUTION!

A pressure calibration becomes necessary if the pressure control measurement was not accurate enough, a new IV-set configured or a pressure sensor replaced or the main board is replaced.

Needed equipment: - a manometer with a resolution of 0,05 bar.
- a 3-way stop cock
- the chosen IV-set (refer to the list
  including the recommended IV-set in the user manual)

5.3.2. Enter the pressure calibration mode

1. Enter into the configuration mode (see chapter 2.3).

2. Select address 399 in this display. Press then key "MODE".

3. Enter value 1234 in this display.

4. Press the "START/STOP" key, the pump starts to running at a constant rate of 200 ml/h. The display shows "CAL. door".
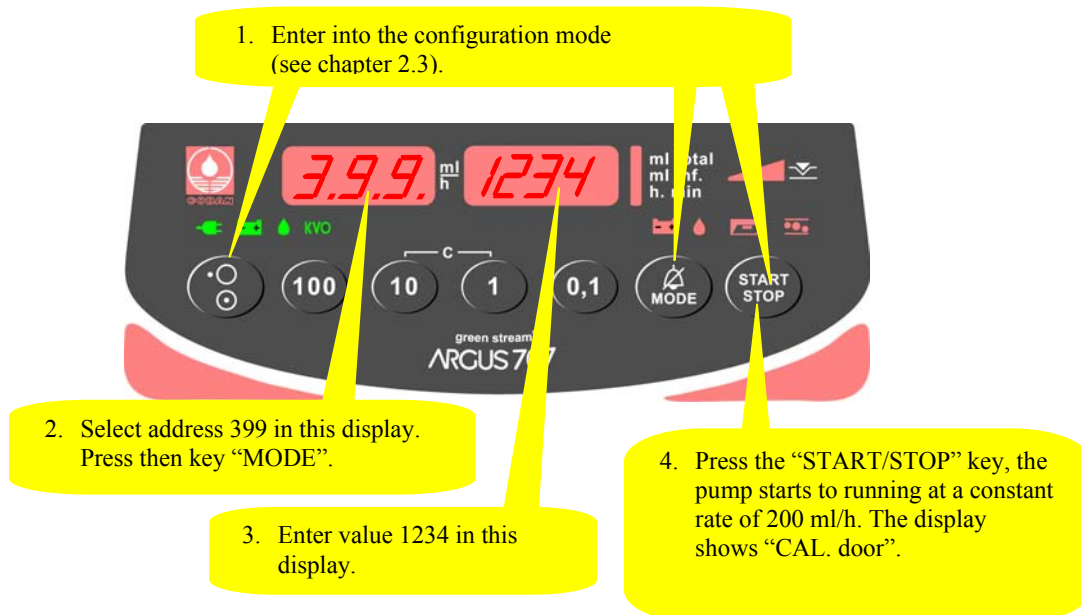
5.3.3. Calibrating the offset of both sensors

Remove any IV-set inserted in the pump!

1. Open the door.

2. Press the "START / STOP" key to store both values for the up- and downstream sensor, this will be acknowledged by a sound.

3. Press the "MODE" key to go to the next calibration step. The display shows "roll CLAM".
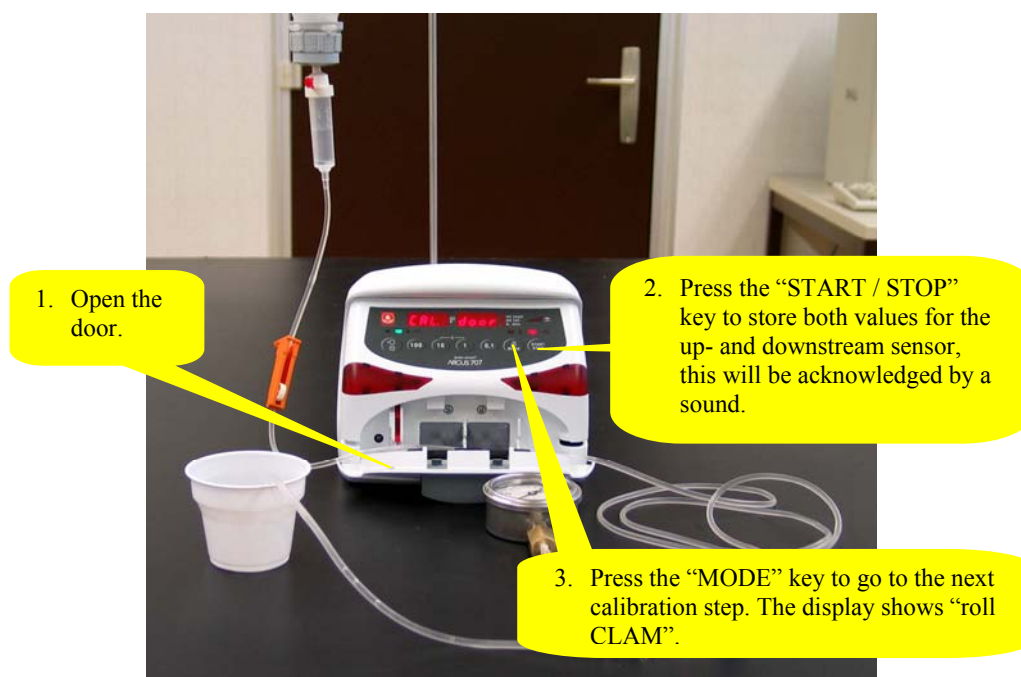
Remark:
By pressing the key "1" the actual value of the offset voltage in mV is displayed, for the upstream sensor in the left hand display, for the downstream sensor in the right hand display. Return to the original state by pressing the key "1" again.

5.3.4. Calibrating the upstream sensor part 1 (left side)

1. Insert a new IV-set filled with water, place the roller clamp on the upstream side near the pump and close the door. Open the roller clamp and let the pump running for 5 seconds at least.

2. Close the roller clamp and wait 10 seconds.

3. Press the "START / STOP" key to store the value for an upstream oc-clusion. This will be ac-knowledged by a sound.

4. Press key "MODE" to enter the next calibration procedure.

   The display shows "CAL. 0.4b".

5. Open the roller clamp for the next step!
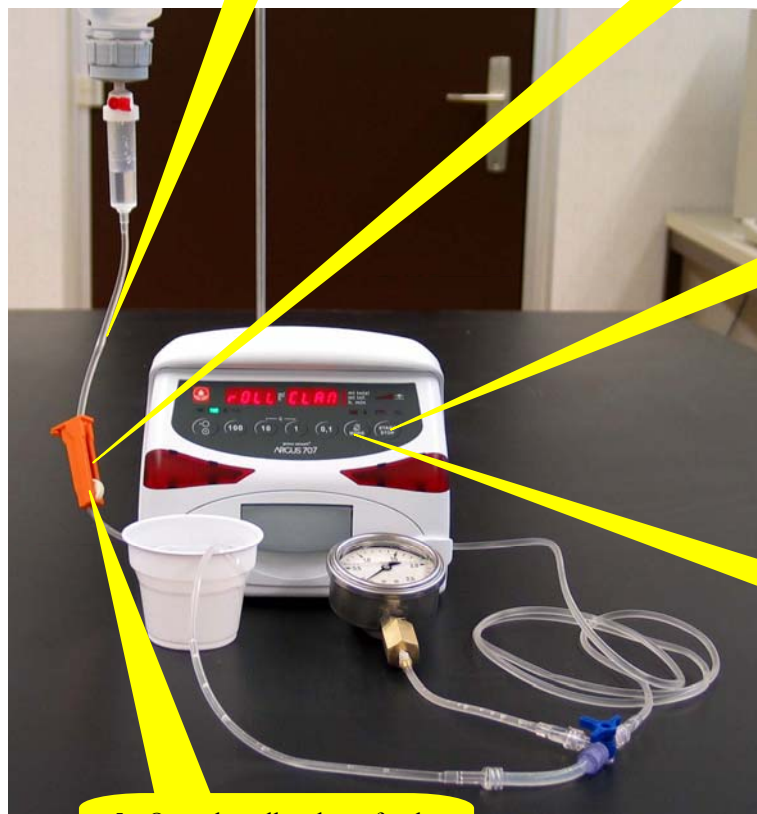
Remark:
By pressing the key "1" the pump display changes to "xxxx Pr S" where the left display shows the actual upstream pressure sensor signal in mV.
Return to the original state by pressing the key "1" again.

5.3.5. Calibrating the downstream sensor (right side).

1. Simulate a downstream occlusion by the 3-way stop cock.
   The pump must generate a pressure of at least 1.4 bar. Otherwise there might be a mechanical problem (pressure plate, door hinge, peristaltic, etc.).
   Release the pressure again.
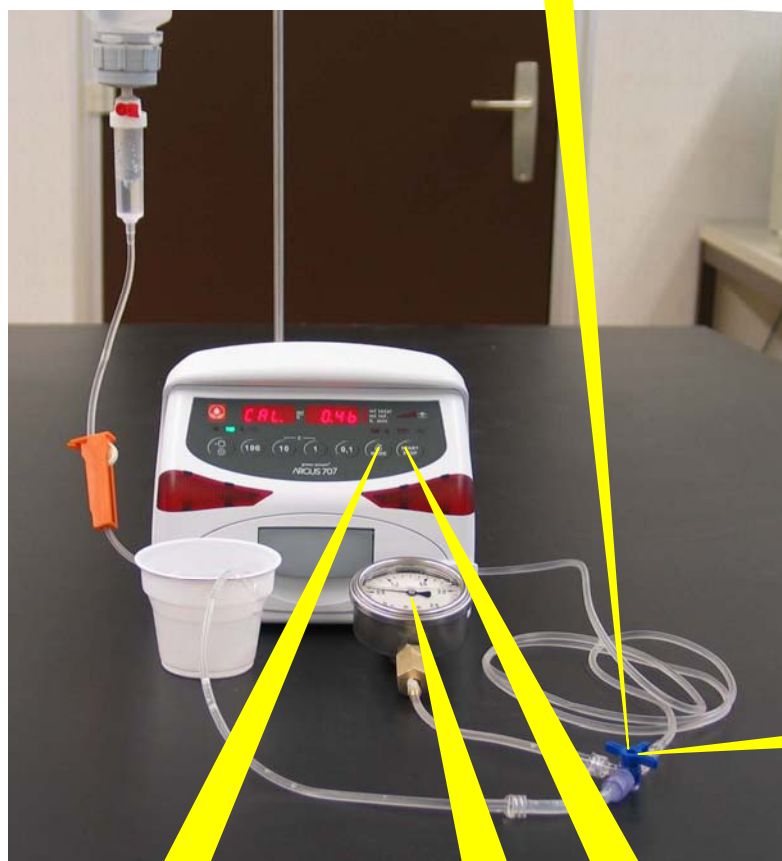
2. Restart a pressure build-up.

   Check for the pressure gauge display which must increase.

4. Press the "MODE" key. The display shows "CAL. 1.4b". Follow the instructions on the next side.

3. Press the "START / STOP" key when a pressure of 0.4 bar has been reached. The stored value will be acknowledged by a sound.

Remark:
By pressing the key "1" the pump display changes to "Pr S xxxx" where the right display shows the actual downstream pressure sensor signal in mV.
Return to the original state by pressing the key "1" again.

5. When the occlusion pressure reaches 1.4 bar press the "START / STOP" key. The stored value will be acknowledged by a sound.
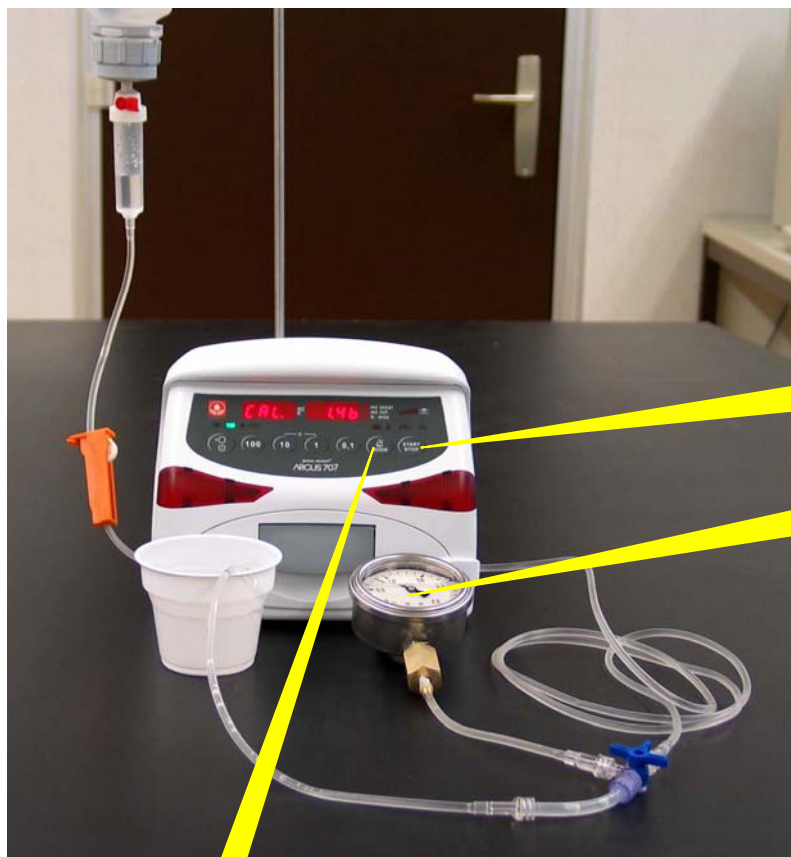
4. Press the "MODE" key. The display shows "CAL. -0.4b". The pump starts to deliver backwards and the pressure in the system decreases.

Remark:
By pressing the key "1" the pump display changes to "Pr S xxxx" where the right display shows the actual downstream pressure sensor signal in mV.
Return to the original state by pressing the key "1" again.

5.3.6. Calibrating the upstream sensor part 2 (left side)

1. Close the roller clamp and install the tube in the **reverse** direction. Close the door.

2. Open the roller clamp.

3. Restart a pressure build-up.
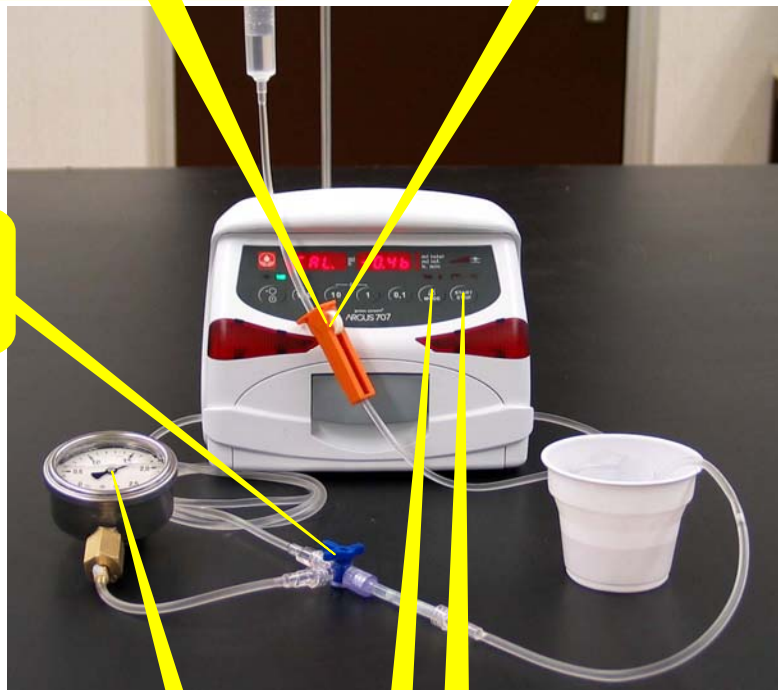
4. Check for the pressure gauge display which must increase.
   Press the "START / STOP" key when a pressure of 0.4 bar has been reached.
   Press key "MODE", the display shows "CAL. –1.4b".

   Repeat this point at a pressure of 1.4 bar.

5. Switch the pump off and insert the IV-set in the normal direction!
   Now, perform a pressure control measurement according to chapter "Pressure control measurement".

Remark(s):

- By pressing the key "1" the pump display changes to "xxxx Pr S" where the left display shows the actual downstream pressure sensor signal in mV.
  Return to the original state by pressing the key "1" again.
- The procedure for the upstream sensor calibration part 2 is equal to the procedure for the downstream sensor, but with inverse delivery direction.

5.4. Pressure control measurement

5.4.1. Downstream control measurement

Start an infusion at an infusion rate of 250 ml/h according to the user manual. Insert a pressure gauge on the downstream (patient) side which monitors the pressure in the tube.

Simulate an downstream occlusion.

The pump must stop and the alarm must be activated at the default pressure limit of 700 mbar ±100 mbar, except a different default pressure limit has been configured.

If the result of this control measurement does not fulfil the stated requirement, a pressure calibration according to chapter "Pressure calibration" has to be done.

5.4.2. Upstream control measurement

Start an infusion at an infusion rate of 250 ml/h with the roller clamp on the upstream side near to the pump.

Simulate an upstream occlusion by closing the roller clamp. To avoid the drop alarm release, simulate falling drops on the drop detector.

The pump must stop after several seconds and an upstream alarm (right hand LED in the pressure bar graph) must be activated.

If the result of this control measurement does not fulfil the stated requirement, a pressure calibration according to chapter "Pressure calibration" has to be done.

5.5. Volume calibration

5.5.1. General

There are two ways to calibrate the volume delivered by the ARGUS707 volumetric pump, select one:

- By entering the correction factor

- With the internal calibration program of the pump

Needed equipment:　　　　　- balance with a resolution of 0,1g at least

5.5.2. Volume calibration by entering the correction factor

1. Insert a new IV-set (only recommended IV-sets may be used, see appendix in the user manual) in the pump and perform a "warm up" infusion of 10 ml at an infusion rate of 999.9 m/h!

2. Infuse now a volume of 15 ml of water in a measuring cup on a zeroed balance at an infusion rate of 250 ml/h.

3. Determine the weight of the delivered water.

4. Enter the configuration mode as described in chapter 2.3.

5. Go to address #319 and read the present correction factor.

6. Calculate the new correction factor as follows:

$$\text{New correction factor} = \frac{(\text{Present factor}) \cdot (\text{weight of delivered water})}{15^*}$$

e.g.:
Present correction factor:　　　1020
Weight of delivered water [g]: 14.9
New correction factor:　　　　1013

* Pre-set volume of point 2.)

7. Enter the new correction factor at address #319 (e.g. 1013) in the right hand display and save it by pressing key "START"; then switch the pump off.

8. Perform a control measurement according to the steps 2 & 3 above. Repeat the calibration procedure if necessary.

5.5.3. Volume calibration with the pump integrated calibration program

Needed equipment: - balance with a resolution of 0,1g at least

1. Insert a new IV-set (only recommended IV-sets may be used, see appendix in the user manual) in the pump (filled with water) and connect the infusion line to a measuring cup on a balance.

2. Enter the configuration mode as described in chapter in chapter 2.3.

   Enter the value "123" at address 399. This will force the pump to enter the calibration mode which will be displayed as "bAL tArA".

3. Press the key "START/STOP". The pump delivers a volume of 5 ml at an infusion rate of 250 ml/h ("tArA" is flashing).

4. When "tArA" stops flashing, reset the balance to 0.

5. Press the key "START/STOP". The pump will display "tM 215" (infusion delivery time is 215 seconds). It should now deliver a volume of 15 ml at an infusion rate of 250 ml/h.

6. After the delivery time has elapsed, the pump stops and shows "baL." "12.75" in the displays.
   Enter now the value of the balance, e.g. 14.90 g. This value must be within the range of 12.75 – 17.25. Otherwise switch the pump off and restart the volume calibration.

7. Press the key "START/STOP" to acknowledge the entered value.

8. The pump displays the new correction factor, e.g. 1013.

9. Press the key "START/STOP" to store the new correction factor acknowledged by a buzzer sound. The pump display changes back to "bAL tArA" again.

10. Switch the pump off. Do not remove the infusion set!

11. Perform a control measurement with an infusion rate of 250 ml/h and an infusion total of 15 ml. Repeat the calibration procedure if necessary.

5.6. Pump specifications

Please refer to the user manual for the specifications (chapter 8).

5.7. Fault codes

A technical failure will be signalled by the pump with a continuous alarm display and a continuous sound. During this state, the fault code which causes the pump to fail can be displayed by pressing the key "MODE".

IF the pump was switched OFF after a detected failure, the fault code will be stored in the configuration of the pump, please refer to chapter 2.6 (Addresses 380-389).

The possible fault codes registered in the configuration are listed in the table below:

```
Fault
Code    Failure


F_21    ROM test
F_22    ROM check (Runtime)
F_23    RAM test/check
F_24    XRAM test/check
F_25    CPU test
F_26    Invalid function menu
F_27    EEPROM data invalid
F_28    RTC data invalid, no RTC etc
F_29    Stepper motor power test (delayed 5s)
F_32    5Volt supply out of range
F_33    24Volt supply out of range (delayed 5s)
F_37    Downstream pressure sensor test failed (always > 4.7V, delayed 5s)
F_38    Upstream pressure sensor test failed (always > 4.7V, delayed 5s)
F_39    Downstream pressure sensor test failed (dynamical test failed)
F_40    Upstream pressure sensor test failed (dynamical test failed)
F_44    Address invalid for config-eeprom
F_45    Address invalid for history-eeprom
F_46    Frequency from uC or RTC out of range
F_47    Display-print not present
F_48    Key(s) too long active
F_49    Sensor-print not present
F_50    AIL (Air in line) detector test failed
F_51    Movement test failed (Home-Pulse < (Hall / Home))
F_52    Movement test failed (Home-Pulse > (Hall / Home))
F_53    More than one rotation at 'STOP' without 'KVO'
F_54    Infused sum <> Calculated sum (Rotations)
F_55    Frequency calculation
F_57    Rotation (SW overflow)
F_58    Volsum control
```

We recommend replacing the main board in case a fault code is not included in this list above.

6. **REPLACEMENT OF PARTS**

6.1. General

CAUTION!
The ARGUS 707 may only be used with accessories and spare parts which have been approved by ARGUS Medical AG for safe technical use.

CAUTION!
If a door, a housing, a pressure sensor or a main board is replaced, a full calibration (pressure sensors and volume calibration) is required.

6.2. Disassembling of the ARGUS 707

CAUTION!
Disconnect the mains cable from the power outlet before opening the housing!
Observe the antistatic protection rules when disassembling the ARGUS 707 (the use of an antistatic table mat and a grounded clip are recommended).

6.2.1. Disassembly of the case

1. Remove the four screws on the back side.

2. Separate the front and the back side.
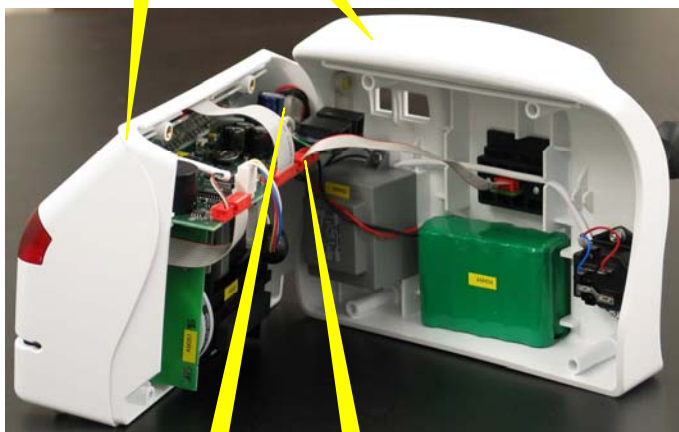
3. Disconnect the battery, the supply and the docking interface connection.

6.2.2. Removing the pump door

1. Gently press this hinge stopper backwards.

2. Pull the shaft towards the centre. Repeat point 1 and 2 for the other side of the door and then remove the door.

6.2.3. Disassembling the pump unit

1. Unscrew these screws. Remove the pump unit.

6.2.4. Assembling the pump

1. Use the screw with a washer at these places (torque 1.0 Nm)!

2. Use the screw without a washer at these places (torque 1.0 Nm)!

3. Reinstall the door. Make sure that a washer has been installed on each side!
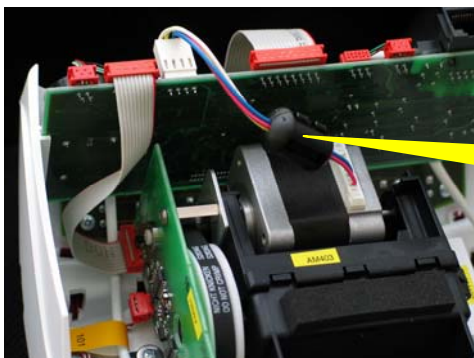
4. Make sure that this part touches nowhere, otherwise noises may be generated!
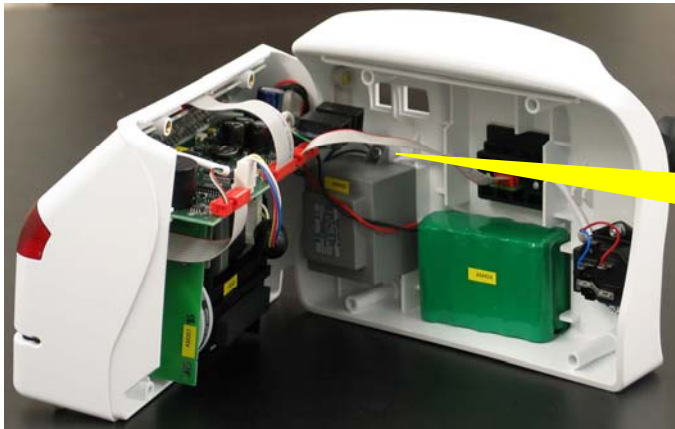
5. Reconnect the back side with the front side (battery, power & docking interface)!

6. Make sure that both cables are correctly placed in the notch before the main board is inserted!

7. Use the short screw at these places (torque 1.1 Nm)!

7. Use the long screw at these places (torque 1.1 Nm)!

Mind the torque for the screws listed below:
Combination clamp   1.0 Nm
Transformer   1.0 Nm
All other screws not mentioned
in this chapter: 0.6 Nm

6.3. Replacements of parts

CAUTION!
The ARGUS 707 may only be used with accessories and spare parts which have been approved by ARGUS Medical AG for safe technical use.

For the part numbers of replacement parts consult the following chapter.

6.4. Spare parts

10.087 Combination clamp

10.089 External drop detector

10.093 Interface cable docking
pumps
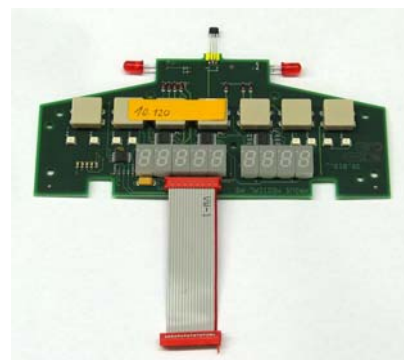
10.120 Display board A707
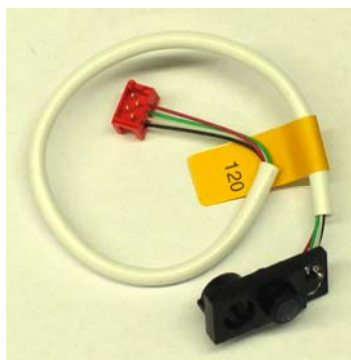
10.121 Pressure sensor
A707
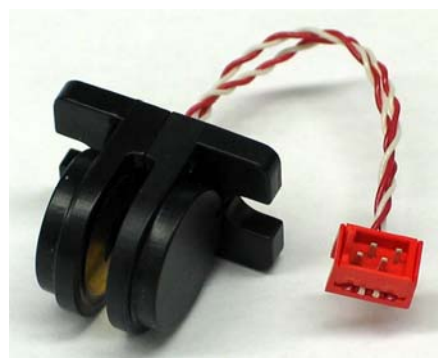
10.122 Air detector A707

10.123 Stop flow A707
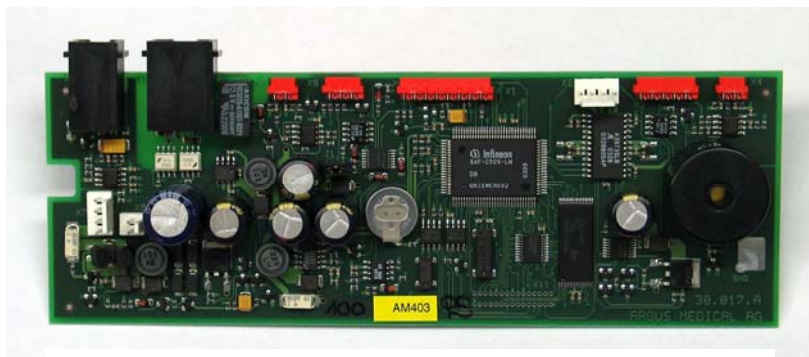
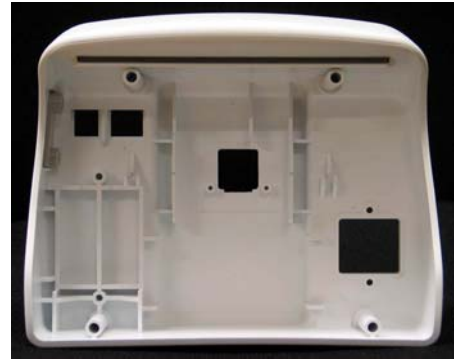10.124 Main board A707
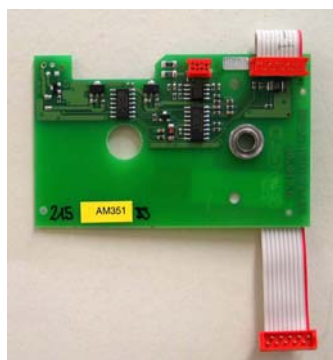
10.125 Sensor board A707

10.126 Pump unit A707

10.127 Door complete A707

10.128 Casing back plane A707
230VAC complete

10.136 Casing back plane A707

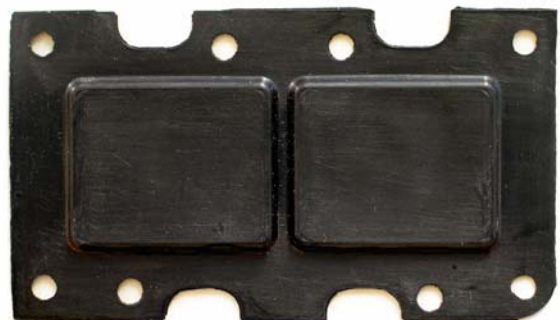10.129 Casing forepart (without door)
complete

10.137 Casing forepart

12.011 Interface cable 8pol/2m
& 12.012 Interface adapter

12.042 Cable staff alert 2m

10.119 Battery NiMHd 12V/1500mAh A707

11.221 Sealing A707

12.035 Pressure gauge
with stopcock

Part no. 11.222 Front panel A707

10.135 Edge board complete A707

11.005 Bottle holder 45 cm
11.043 Bottle holder 60 cm

| Part no.	Description	Part no.	Description
11.237	Identification plate A707	11.244	Short instruction Czech
11.238	Label flow direction	11.245	Short instruction Portuguese
11.239	Short instruction German	11.246	Short instruction Spanish
11.240	Short instruction English	11.247	Short instruction Italian
11.241	Short instruction French		
11.242	Short instruction Danish		
11.243	Short instruction Dutch		

7. SAFETY STANDARD CHECK

The safety check should be done at least every 10'000 running hours or every 24 months.

Refer to the form in the appendix of this manual.

8. WIRING DIAGRAMM
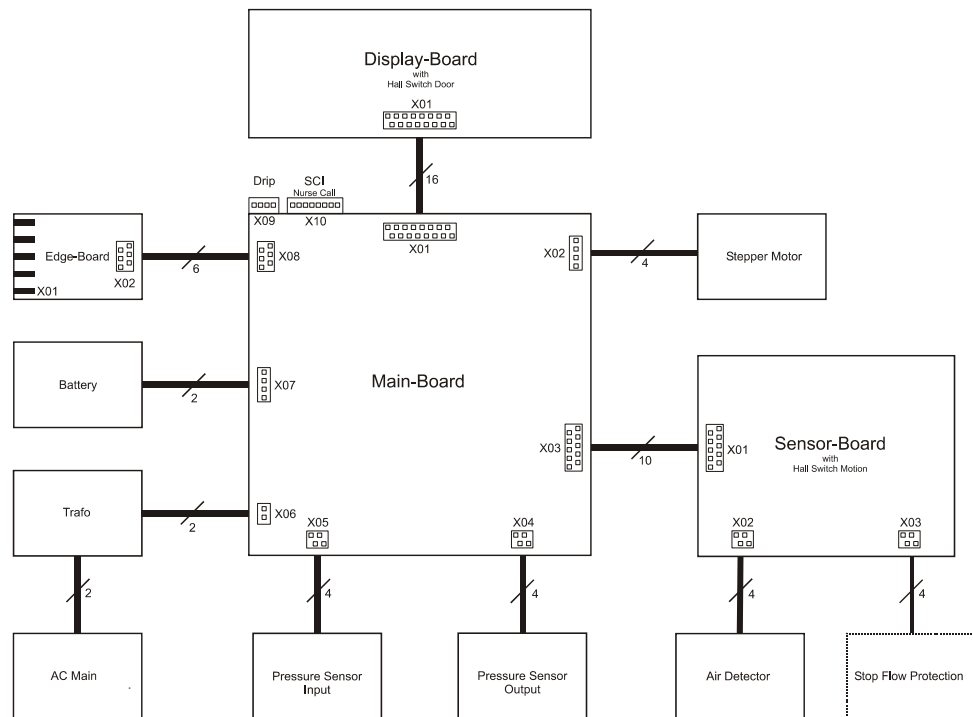
9. BLOC SCHEMATIC
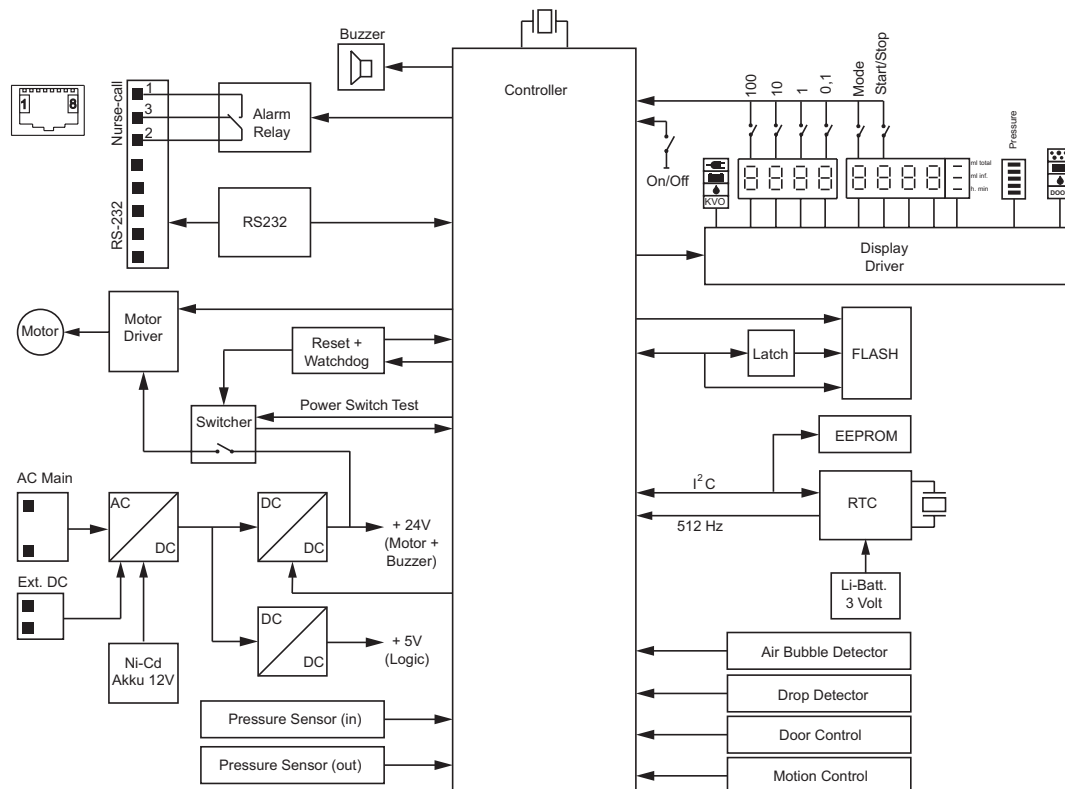
10. APPENDIX

Safety standard check (SSC)		**ARGUS 707**	**ARGUS Medical AG**	
Serial-no.: ………………………………………..		Inventory-no:……………………..………………		
Hospital:	………………..………………………………………………………………..			
Department:	………………..………………………………………………………………..			
Customer:	………………..………………………………………………………………..			
The SSC has to be performed at least every 24 months or after 10'000 hours of operation. The check has to be done in accordance to the user- and service manuals.				
1	Visual check for damage, cleanness and completeness	- Housing, labels, accessories, connectors, power cable, etc.		
2	Test the function of the stop flow clamp	- Proper movement of the clamp		
3	Keep "MODE" pressed while switching on the pump	- Display pump type and software release - Display of 2, 4, 7, F., in numeric display - Display of all operation- and alarm indicators		
4	Connect/Disconnect the pump to the mains	- The indicator "external supply" lights up		
5	Test the drop detector by simulating drops	- Check the green "drop" indicator		
6	Test the door switch, open and close the door	- Door open the "door" indicator lights up - Door close the "door" indicator turns off		
7	Open the door and remove any IV-set	- Indicator "air bubble" lights up		
8	Install a water filled IV-set, close the door	- Indicator "air bubble" turns off		
9	Set rate to 333.3 m/h, press "START", disconnect the drop detector	- The red indicator "drop" lights up (delayed) - The acoustical alarm turns on		
10	Press "MODE"	- The acoustical alarm mutes		
11	Check the external connector "nurse call"	- Relay contact switches (see chapter 9)		
12	Calibration of the pressure sensors IV-set type used: Codan……… Other………………..………………….	- See chapter 5.3 and 5.4 of the service manual		
13	Volume calibration	- See chapter 5.5 of the service manual		
14	Charge the battery while the pump is running 16 hours, at a rate of 30.0 ml/h	- The indicator "external supply" must light		
15	Battery check at a rate of 30 ml/h. Run the battery test until the pump switches off automatically	- The green indicator "battery" lights up during this test		
16	Printout the pump history (refer to chapter 3.4)	- Check the battery run time by checking the latest history entries, > 4h 30min - Check the pump internal time and date		
17	Electrical test according to EN60601-1 (all measurements made with a power cable 2.5 m)	- Measurements attached		
18	Charge the battery after this test!			
	The pump has passed the SSC and is safe for use			
	Date:	………………..………………………………………………………………..		
	Name:	………………..………………………………………………………………..		
	Signature:	………………..………………………………………………………………..		